

Estimate of funds required for the Battalion of Engineers and Engineer Depot at Willets Point, New York Harbor, for the fiscal year ending June 30, 1881.

For the purchase of materials for continuing present course of instruction of the battalion, including the engineer company at West Point, in field engineering	\$1,500 00
For incidental expenses of depot, such as remodeling ponton trains; repairing instruments; purchasing fuel, forage, stationery, chemicals; extra-duty pay for soldiers engaged in special skilled labor, such as wheelwright work, printing, binding, photographing, and lithographing; engineer documents, &c.	4,000 00
Purchase of a small astronomical telescope (5-inch) for use in the field observatory	1,500 00
Total	7,000 00

RIVER AND HARBOR IMPROVEMENTS.

The construction, repair, preservation, and completion of certain public works on rivers and harbors, and the surveys and examinations connected therewith, have been prosecuted during the fiscal year ending June 30, 1879, with the means provided by the river and harbor act approved June 18, 1878, and with the balances of previous appropriations remaining unexpended July 1, 1878, and available for objects therein specified.

Amount appropriated by act approved June 18, 1878	\$8,201,700 00
Balances of former appropriations applicable to continuation of work July 1, 1878	1,608,678 48
Amount appropriated by act approved March 3, 1879, exclusive of appropriations made for improvement of South Pass of the Mississippi River	7,094,100 00
	16,904,478 48
Amount expended, including outstanding liabilities, during fiscal year ending June 30, 1879	6,132,301 95
Amount available July 1, 1879	10,772,176 53

The act of March 3, 1879, makes provision for 249 works of improvement in sums varying from \$1,000 to \$300,000; and for surveys and examinations with a view to improvements at 98 localities.

The appropriations contained in the above act, except in cases of emergency, were not made available for expenditure until July 29, when instructions were issued to the officers to proceed with the execution of all works the plans and projects for which had been previously approved. In the case of new works, examinations, investigations, and surveys were at once undertaken, upon the results of which depend the selection and determination of the proper projects for the works of improvement. In some cases, delays have arisen from the necessity of considering certain legal questions which must be settled before the money appropriated can be expended upon the sites.

The examinations and surveys required and provided for in the second and third sections of the act have been distributed and assigned to the officers in charge of the several river and harbor districts; and it is expected that, with few exceptions, reports may be received in time to be submitted during the ensuing session of Congress.

There is given below a brief summary for each improvement, showing its condition and progress made during the fiscal year, accompanied by a money statement setting forth the amount expended during the fiscal year; the amount available July 1, 1879; and, in compliance with the requirements of section 2 of the acts approved June 23, 1866, and March

2, 1867, "a full estimate for its [each work] entire and permanent completion, with the amount that can be profitably expended in the next fiscal year." For more detailed information in regard to each work attention is respectfully invited to the reports of the officers in charge, which will be found in the appendix.

The Board of Engineers constituted in July, 1878, to take into consideration the improvement of the low-water navigation of the Mississippi and Missouri Rivers entered upon the duties referred to in the last annual report, and made considerable progress in the surveys, examinations and investigations, preliminary to the preparation of a systematic plan of improvement, but in consequence of the creation of the Mississippi River Commission, in compliance with the act approved June 28, 1879, the Board of Engineers was, by your direction, on July 25, 1879, dissolved, and its secretary was directed to prepare, under instructions of Col. Z. B. Tower, Corps of Engineers, the information collected, with a view to its being turned over to the commission.

A preliminary report from this Board was transmitted to Congress in January last, as also a report with reference to the effect of a continuous and permanent levee system on the Mississippi, below the mouth of the Ohio, upon the low-water navigation of the river, and its benefits in affording facilities to its commerce in high stage.

These will be found in Appendix M of this report.

ATLANTIC COAST.

IMPROVEMENT OF RIVERS AND HARBORS IN THE STATES OF MAINE, NEW HAMPSHIRE, AND MASSACHUSETTS.

Officer in charge, Lieut. Col. George Thom, Corps of Engineers.

1. *Saint Croix River, above the "Ledge," Maine.*—The following appropriations have been made by Congress for the improvement of this river, to wit:

By act approved March 2, 1867	\$15,000 00
By act approved March 3, 1873	10,000 00
By act approved June 23, 1874	10,000 00
Total	35,000 00

As this river, throughout its whole extent, forms a part of the international boundary between Maine and New Brunswick, the act of March 2, 1867, contained the proviso that—

The Province of New Brunswick contribute and pay to the proper disbursing officer a like sum for said purpose, said payment being made on condition that in no event shall the Province of New Brunswick be called upon for more than half the sum actually expended for said purpose.

In 1873 the Dominion of Canada appropriated the sum of \$25,000 for the improvement of this river; but in consideration of the fact that the obstructions to its navigation had been caused by the deposit of "waste" from the saw-mills above, and that no law is in force for preventing the continuance of this practice, the Department of Public Works of the Dominion of Canada declined to authorize the expenditure of the appropriation until satisfied that this practice is permanently discontinued.

For the foregoing reasons no work has hitherto been done towards the improvement of this river, with the exception of the survey made in 1873, a map of which with a project and estimate for its improvement was made in March, 1874.

By the river and harbor act of March 3, 1879, the sum of \$10,000 was appropriated for improving Lubec Channel, Maine; "and for the purpose of this improvement the unexpended balance of the appropriations made for the improvement of Saint Croix River by the acts of March 2, 1867, March 3, 1873, and June 23, 1874 [as above], is made available," now amounting to the sum of \$34,000.

July 1, 1878, amount available.....	\$34,000 00
Amount transferred by act approved March 3, 1879, to improvement of Lubec Channel, Maine.....	34,000 00

(See Appendix A 1.)

2. *Improvement of Lubec Channel, Maine.*—In compliance with the river and harbor act of June 18, 1878, a survey was made of this channel in October and November, 1878, and a report, with a project, drawings, and estimates for its improvement was submitted by Lieutenant-Colonel Thom, on the 12th of December, a copy of which accompanies this report. The project consists in widening and deepening the main channel by dredging, where necessary, between the head of "the Narrows" and deep water below the "western bar beacon," a distance of about 2½ miles, so as to obtain a channel not less than 200 feet in width for a depth of 12 feet at mean low-water, or 9 feet at low-water of spring tides. The estimated cost of this improvement is \$47,000. By the river and harbor act of March 3, 1879, the sum of \$10,000 was appropriated for this work, with a provision that the unexpended balance of the appropriations made for the improvement of Saint Croix River, Maine, by the acts of March 2, 1867, March 3, 1873, and June 23, 1874, amounting to \$34,000, is also made available therefor, making a total amount of \$44,000 applicable to the same.

Operations will be commenced as soon as this amount becomes available, which may be found sufficient for completing the whole work; so that no further appropriation is asked for at present.

Amount appropriated by act approved March 3, 1879.....	\$44,000 00
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(See Appendix A 2.)

3. *Improvement of Penobscot River, Maine.*—The work originally projected for the improvement of this river consisted:

1. In the enlargement and straightening of its channel through the several bars and shoals at and near Bangor, so as to have a width of not less than 200 feet and a depth not less than 11 feet at low tide (or 24 feet at high tide) in the lowest stages of the river, giving about 14 feet at low tide in its ordinary stages.

2. In breaking up and removing all the sunken ledges and bowlders in the harbor of Bangor, outside the main channel down to the level of the general bed of the river, including Independence Rock, Gulliver's Rock, the ledge near steamboat wharf and those near Dole's wharf, Green's Pier, and Green's Pier Ledge, and a ledge outside of it; also the bowlders and ledges in front of the wharves at High Head.

At the beginning of the fiscal year (July 1, 1878) the improvement of all the bars and shoals then projected had been completed, with the exception of those in front of the wharves at High Head; and all the sunken rocks had been broken up and removed to the extent projected, with the exception of several outcroppings of ledge, discovered in 1875-'76, in and near the Middle Ground Channel, for the partial removal of which a contract has been made.

During the past year the removal of the ledge in the Middle Ground Channel has been completed.

Under the appropriation of June 18, 1878, a contract was made for the removal down to the general bed of the river of all the sunken ledges north of and near the Middle Ground Channel (aggregating 81½ cubic yards), which work was completed in November last; also a contract for all the projected dredging in front of the wharves at High Head, which work was completed in October last; also for the partial removal of the sunken ledges in front of those wharves, which work will probably be completed before the close of the present season.

The river and harbor act of June 8, 1878, appropriating \$12,000 for the improvement of Penobscot River, provided that \$2,500 of it should be expended "at or near the Narrows of said river at Bucksport." This amount was expended in October last in the further removal by dredging of the Middle Ground in Bucksport Harbor to the full extent deemed necessary.

The only work that now remains to be done for completing all the improvements hitherto projected for this river consists in completing the removal of the sunken ledges in front of High Head wharf, for which the amount appropriated by the act of March 3, 1879 (viz, \$6,000), is deemed sufficient. No further appropriation is required.

July 1, 1878, amount available.....	\$15,497 73	
Amount appropriated by act approved March 3, 1879.....	6,000 00	\$21,497 73
July 1, 1879, amount expended during fiscal year.....	13,678 98	
July 1, 1879, outstanding liabilities.....	862 84	14,541 77

July 1, 1879, amount available.....	6,955 96
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(See Appendix A 3.)

4. *Improvement of Belfast Harbor, Maine.*—The improvements projected for this harbor consist in deepening it from the wharf-lines out to deep-water, so as to have not less than 10 feet of water at mean low-water, and in building a breakwater to afford safe anchorage for shipping in easterly storms.

Under the appropriation of \$12,000 made for this harbor by the act of June 18, 1878, a contract was made for dredging to a depth of 10 feet at mean low-water all the shoal ground in front of the wharves as far downward (eastward) as a line 300 feet above Sanford's wharf. This work was completed in May last.

Under the appropriation of \$5,000 made by act of March 3, 1879, it is proposed to continue this improvement downward for a depth of 12 feet at mean low-water to such an extent as the limited amount will allow; but to complete the dredging as now projected will require an additional amount of \$9,000.

July 1, 1878, amount available.....	\$12,031 96	
Amount appropriated by act approved March 3, 1879.....	5,000 00	\$17,031 96
July 1, 1879, amount expended during fiscal year.....	11,801 49	
July 1, 1879, amount available.....	5,230 47	

Amount (estimated) required for completion of existing project, not including breakwater.....	\$9,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	9,000 00

(See Appendix A 4.)

5. *Improvement at the gut opposite Bath, Maine.*—By the river and harbor act of June 18, 1878, the sum of \$17,000 was appropriated for the improvement of this channel to the extent then projected, viz:

1. Straightening, widening, and deepening the channel by dredging through the shoal above Upper Hell Gate.

2. Widening the passage through Upper Hell Gate.

3. Removing the most dangerous of the sunken ledges from the channel in Upper Hell Gate and on the north side of Marsh Island below.

Under this appropriation, a contract was made October 1, 1878 (after a very minute and extended survey of the locality), for breaking up and removing, at \$30 per cubic yard, 200 cubic yards (more or less) of sunken ledge, to a depth of 12 feet at mean low-water (including Boiler Rock, previously reduced to a depth of 10 feet). Work was commenced by the submarine party under this contract on the 8th of October, and continued up to the 20th of January, and then suspended for the winter. During this period Boiler Rock (containing 63½ cubic yards) was broken up and removed to the required grade. Operations were resumed on the 27th of May, and up to the 30th of June, 1879, 48½ cubic yards more had been removed to grade at a ledge below Boiler Rock; making a total of 111½ cubic yards removed to grade during the year.

Proposals were also invited in September last for the dredging above the Upper Hell Gate; but as the bids were not satisfactory, they were not accepted. They were again invited in June, 1879, and on the 23d of June a contract was made for the dredging at 30 cents per cubic yard, the work to be completed on or before the 15th of August.

For completing all the additional work necessary for the safe navigation of this channel, as shown by accurate surveys recently made, an additional appropriation of \$18,000 will be required.

July 1, 1878, amount available	\$17,000 00
July 1, 1879, amount expended during fiscal year	\$3,969 90
July 1, 1879, outstanding liabilities	600 00
	4,569 90

July 1, 1879, amount available	12,430 10
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Amount (estimated) required for completion of existing project	18,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	18,000 00

(See Appendix A 5.)

6. *Improvement of Portland Harbor, Maine.*—All the work projected for the improvement of this harbor has been completed, with the exception of the dredging in front of the harbor commissioners' line above Merrill's wharf; but this work is for the present suspended until the several wharves above Merrill's wharf are removed so far as they extend beyond the harbor lines. The funds now available are sufficient for this purpose.

July 1, 1878, amount available	\$41,908 38
July 1, 1879, amount expended during fiscal year	773 38

July 1, 1879, amount available	41,135 00
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(See Appendix A 6.)

7. *Improvement at Richmond's Island, Maine.*—The improvement projected for this place consists in making a harbor of refuge by means of a rubble-stone breakwater to connect the island with the mainland. The length of the proposed breakwater is about 2,000 feet, with an average thickness of 25 to 30 feet, and a height of 4 feet above ordinary high-water.

Under the appropriation of \$6,000 made by act of June 18, 1878, 5,983 tons of granite grout has been furnished and placed upon the work, under two separate contracts. To complete it in accordance with the original project, 6,000 tons more will be needed, for which an appropriation of \$6,000 will be required.

July 1, 1878, amount available	\$6,000 00
Amount appropriated by act approved March 3, 1879	3,000 00
	\$9,000 00
July 1, 1879, amount expended during fiscal year	5,961 26
July 1, 1879, amount available	3,038 74
Amount (estimated) required for completion of existing project	6,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	6,000 00

(See Appendix A 7.)

8. *Improvement of Kennebunk River, Maine.*—The work projected for the improvement of this river under the appropriation of \$10,000 made by the river and harbor acts of July, 1870, and March, 1871, consisted in the extension and repair of the two stone piers at its mouth, and the repair of the United States Government wharf, a short distance above. This work was completed in 1872. Under the appropriation of \$5,000 made by the river and harbor act of August 14, 1876, the channel of the river was straightened, widened, and deepened by dredging at the Wading-place and Mitchell's Point, so as to have a depth of 4 feet at mean low-water, or about 13 feet at mean high-water. Extensive repairs were also made where most necessary on the stone piers at the mouth of the river, as well as on the government wharf above. In order to complete all the work now projected for the improvement of this river, there will be required, as estimated by the engineer officer in charge, a further appropriation of \$4,000.

Amount appropriated by act approved March 3, 1879	\$2,000 00
July 1, 1879, amount available	2,000 00

Amount (estimated) required for completion of existing project	4,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.	4,000 00

(See Appendix A 8.)

9. *Improvement of Cochecho River, New Hampshire.*—The project for the improvement of this river consisted of making a channel not less than 40 feet in width and 4 feet in depth at mean low-water from the foot of the Lower Narrows up to Packet Landing, the total cost of which was estimated at \$85,000, the amount that has been appropriated therefor by Congress.

Under the several appropriations made from 1871 to 1878, inclusive, for this river, the following work has been done, viz:

1. A channel has been opened through the ledge at the Upper Narrows for a length of 430 feet, and to a width of 40 feet and a depth of 4 feet at mean low-water, or about 10½ feet at ordinary high-water.

2. A channel has been opened through the ledge next above the Upper Narrows for a length of 260 feet and to a width of 40 feet, and a depth of 4 feet at mean low-water.

3. The channel at and near the Lower Narrows has been opened by the removal of sunken ledges and bowlders, and numerous scattered bowlders which were dangerous obstruction to navigation at Trickey's Shoal, Clement's Point Shoal, and elsewhere, have been broken up and removed.

4. The channel and the basin at the Packet Landing have been opened by dredging through the several shoals that existed between the Lower Narrows and Packet Landing, including Gulf Shoal.

This completes all the work projected for the improvement of this river.

Under the appropriation of \$6,000 made by the river and harbor act of June 18, 1878, the obstructions at Gulf School have been removed.

during the past year, whereby a channel has been opened for a width of 100 feet to a depth of 4 feet at mean low-water.

No further appropriation is required for this river.

July 1, 1878, amount available.....	\$6,895 83
July 1, 1879, amount expended during fiscal year	6,895 83

(See Appendix A 9.)

10. *Improvement of Portsmouth Harbor, New Hampshire.*—In compliance with the river and harbor act of June 18, 1878, a survey was made of this harbor in September and October last, and a report with drawings, project, and estimates for its improvement was made and submitted to Congress January 15, 1879, and printed in Senate Ex. Doc. No. 29.

This project consists:

1. In closing the channel between Great Island and Goat Island by a breakwater, so as to stop the strong current that passes through there on the flood-tide, whereby vessels passing up the harbor are thrown upon Goat Island ledge;

2. The removal of Gangway Rock from the channel opposite the navy-yard to a depth of 20 feet at mean low-water; and,

3. The removal in part of the ledge projecting from the southwest point of Badger's Island to a depth of 10 feet at mean low-water.

The cost of these improvements is estimated at \$150,000.

By the river and harbor act of March 3, 1879, the sum of \$10,000 was appropriated for the improvement of this harbor, which is to be applied to the partial construction of the breakwater between Great Island and Goat Island.

Amount appropriated by act approved March 3, 1879	\$10,000 00
July 1, 1879, amount available.....	10,000 00

Amount (estimated) required for completion of existing project	140,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881 (as revised in this office)	70,000 00

(See Appendix A 10.)

11. *Improvement of Merrimac River, including the Harbor of Newburyport, Massachusetts.*—The project for the improvement of this river consists in deepening its shoals by dredging and by the removal of sunken ledges and bowlders from its channel, so as to have a depth of 12 feet at ordinary high-water from its mouth in Newburyport Harbor, Massachusetts, up to Haverhill, Mass. (a distance of 15 miles), and thence for a distance of about four miles up through "the falls" a depth of 4 feet in the ordinary stages of the river, and for the improvement of Newburyport Harbor in the removal of the Gangway, North Gangway, and South Gangway Rocks to a depth of 9 feet at mean low-water; the removal of "the Boilers" (sunken rocks near the city wharves) to a depth of 5 feet, at mean low-water; the removal of 4 dilapidated sunken piers, abreast of Black Rock Creek, near the mouth of the harbor, and of other impediments to navigation.

The work done during the past fiscal year under the appropriation of \$10,000 made by the act of June 18, 1878, consisted in breaking up and removing to a depth of 9 feet at mean low-water over 300 cubic yards of the outer portion of North (Gangway) Rock. On the 10th of August a contract was made for this work at \$28 per cubic yard, measured in situ, and it was satisfactorily completed on the 28th of June, 1879.

The work thus far done for the improvement of Newburyport Harbor, in addition to the above, is as follows, to wit:

Gangway Rock, for the most part reduced to grade in 1870, and the

sunken wreck of the schooner Globe broken up and removed from the harbor in the same year.

In the estimates submitted by the officer in charge for the work that remains to be done for completing all the improvements of this harbor, additional work not heretofore contemplated is included, which increases previous estimates.

The work that has been done for the improvement of the river above Newburyport is as follows, viz:

The channel above Haverhill, Mass., nearly completed at Hazelton Rapids, Lower Falls, and Upper Falls, for a depth of 4 feet in the ordinary stages of the river, and all the shoals dredged and sunken rocks removed below Haverhill, except some sunken bowlders near Rocks Bridge (about 6½ miles below Haverhill).

The work that remains to be done above Newburyport is stated in the accompanying report of the engineer officer in charge, the estimate of which is	\$6,000 00
Amount estimated as above, for completing the projected improvement in Newburyport Harbor.....	23,000 00

Total	29,000 00
Less amount appropriated by act of March 3, 1879.....	5,000 00

Additional amount required for completing all the projected improvements.....	24,000 00
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July 1, 1878, amount available.....	\$10,180 10
Amount appropriated by act approved March 3, 1879.....	5,000 00

July 1, 1879, amount expended during fiscal year.....	9,442 87
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July 1, 1879, amount available.....	5,737 23
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Amount (estimated) required for completion of existing project.....	24,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881.....	24,000 00

(See Appendix A 11.)

12. *Improvement of Boston Harbor, Massachusetts.*—During the past year the following work has been done for the improvement of this harbor, viz:

1. The removal of the sunken ledges in the Upper Middle channel, which commenced in April, 1878, was completed on the 20th of August, 1878, 82 cubic yards having been broken up and removed to grade during that period, of which 32 cubic yards have been removed since July 1, 1878. Under the same contract the removal of several scattered ledges (aggregating 208 cubic yards) situated near Kelly's Rock in the lower harbor, which was commenced in June, 1877, was completed on the 12th of June, 1879, of which 131½ cubic yards have been broken up and removed since the first of July, 1878.

2. In August, 1878, a submarine party was employed in the removal of sunken bowlders and ledges from Nash's Rock Shoal, in continuation of the work done there in 1876 and 1877, whereby all the work projected for the improvement of this shoal has been completed. By these operations the depth of water on this shoal has been increased about 7 feet, so as to give not less than 20½ feet of water at mean low-water on its shoalest part.

3. The reconstruction of the sea-wall at the southeast bluff of Lovell's Island was commenced about the middle of June, 1878, and continued until the 9th of December, when work was suspended for the winter. It was resumed on the 14th of April and completed on the 21st of June, 1879.

4. Under the appropriation of \$55,000 made by the act of June 18, 1878, proposals were invited and a contract made, August 15, 1878, for the removal, by dredging, of the Man-of-War Shoal, situated at the confluence of Mystic and Charles Rivers in the upper harbor, so as to have a depth of 23 feet at mean low-water. This work was carried on day and night from the 26th of August to the 15th of December, when it was suspended (for the winter) until the 24th of April and then resumed. At the end of the fiscal year it was about two-thirds done, with a probability of its completion before the close of the present season.

5. Under the appropriation of June 18, 1878, proposals were also invited, and a contract made for breaking up and removing to a depth of 23 feet at mean low-water the only remaining sunken ledge near Kelly's Rock, it being the only one now known as requiring removal in this harbor. About 145 cubic yards of it are to be removed for obtaining the required grade. It is probable that it will be completed before the close of the present season.

6. Some repairs, where found necessary, have also been made during the past year on the several sea-walls built on the north head of Lovell's Island, Gallop's Island, Long Island, the north head of Deer Island, and Rainsford Island.

On referring to the accompanying report of the officer in charge, it will be seen that the work that remains to be done for completing all the improvements now projected for this harbor consists of the following, viz:

1. Completing the removal of Man-of-War Shoal as contracted for.
2. Removing sunken ledge near Kelly's Rock as contracted for.
3. Deepening and widening the main ship-channel at Anchorage Shoal, and at the Lower Middle; also in the upper harbor near the mouth of Mystic River, and in Charles River from its mouth to the head of tide-water; the latter being a new item for which appropriation has not heretofore been recommended.

The total estimated cost of all these works, including contingencies, &c. \$268,306 84
Amount available therefor July 1, 1879..... 73,306 84

Additional amount required for completing same 195,000 00

July 1, 1878, amount available..... \$75,201 44
Amount appropriated by act approved March 3, 1879..... 50,000 00

July 1, 1879, amount expended during fiscal year..... \$125,201 44
July 1, 1879, outstanding liabilities..... 49,402 50
2,492 10

51,894 60
July 1, 1879, amount available..... 73,306 84

Amount (estimated) required for completion of existing project..... \$195,000 00
Amount that can be profitably expended in fiscal year ending June 30, 1881 (as revised in this office)..... 100,000 00

(See Appendix A 12.)

13. *Improvement of Plymouth Harbor, Massachusetts.*—The several appropriations heretofore made for this harbor have been applied to the construction of bulkheads, jetties, and groins for the preservation and strengthening of Long Beach, upon which the harbor depends for its existence; also to the partial opening of a channel leading from the Middle Ground up to the wharves of Plymouth. This channel is projected to have a width of 100 to 125 feet for a depth of 6 to 8 feet at mean low-water, or 16 to 18 feet at mean high-water. In 1875 it was opened to a width of about 50 feet up to Long Wharf, and to a depth of 6 feet at mean low-water.

Under the appropriation of \$5,000, made by the act of June 18, 1878, the work for the extension of the stone bulkhead, and for the repairs or the other works on Long Beach, where necessary, was carried on from the 20th of August to the end of November last, when it was suspended for the winter, the work having been done by hired labor and with materials purchased in open market.

The work projected for the improvement and preservation of Long Beach has been completed with the exception of the stone bulkhead at its outer end, which will probably be completed before the close of the present season.

By the act of March 3, 1879, the sum of \$3,500 was appropriated for the further improvement of this harbor, leaving still required for its completion the additional sum of \$21,500.

July 1, 1878 amount available..... \$5,088 07
Amount appropriated by act approved March 3, 1879..... 3,500 00

July 1, 1879 amount expended during fiscal year..... \$8,588 07
2,992 60

July 1, 1879, amount available..... 5,595 47

Amount (estimated) required for the completion of existing project..... 21,500 00
Amount that can be profitably expended in fiscal year ending June 30, 1881. 21,500 00

(See Appendix A 13.)

14. *Improvement of Provincetown Harbor, Massachusetts.*—The several appropriations heretofore made for the preservation and improvement of this harbor have been applied to the construction of the following works, viz:

Bulkheads and jetties of various descriptions have been built from time to time along Beach Point, for its preservation and protection, both by the United States Government and by the local authorities.

A dike was built in 1868 and 1869 by the State of Massachusetts across the outlet of East Harbor Creek.

A dike was built in 1868 and 1869 by the United States Government across East Harbor Creek, at the Wading-place near High Head, about 2 miles above the outlet of the creek.

Wooden bulkheads and jetties have been built at different times for the protection and preservation of the beach on Long Point and Beach Point.

A stone bulkhead for about 700 feet in length has been built for the protection and preservation of the outer end of Long Point, the lighthouse, and three-gun battery.

A dike (272 feet in length) was built in 1871-'72 across the head of Lancey's Harbor, near Abel Hill.

Beach-grass planted on Beach Point, Long Point, Abel Hill, Cove Section, and Oblique Section; and at the last two places brush has also been laid for their further protection.

The projected extension of the several jetties on Beach Point and State Dike has been completed.

A bulkhead and 6 jetties, built for the preservation and protection of the beach at Cove Section, near High Head, where encroached upon by the extraordinary gales of November, 1873, and January, 1874. This bulkhead is 607 feet in length, and the jetties have an aggregate length of 126 feet. They consist of a frame-work filled with brush and ballasted with stone, and were completed in December, 1874.

Accurate resurveys were made in 1871-'72-'73-'74 and 1875 of Cove Section, Oblique Section, Beach Point, and Long Point, together with elaborate soundings and current-observations in the inner harbor.